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Updating the distribution and population status of Jaguarundi, *Puma yagouaroundi* (É. Geoffroy, 1803) (Mammalia: Carnivora: Felidae), in the southernmost part of its distribution range

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Abstract

We report new occurrence records of *Puma yagouaroundi* (É. Geoffroy, 1803), a widely distributed but little known Neotropical carnivore, obtained over the last 10 years in Buenos Aires province, central Argentina. The records were collected by camera trapping surveys ($n = 384$ stations) and 195 interviews with local inhabitants. Our results improve our understanding of this species' geographic range, especially its southernmost limit, and abundance, and confirm the need for more detailed studies to better assess the conservation status of this species in central Argentina and other parts of its range.

Key words

Argentine Espinal; carnivores; abundance; camera trapping; interviews.

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Introduction

Understanding the limits of geographic distributions of species and the factors determining them is a fundamental topic in biology (e.g. MacArthur 1972, Gaston 2003, Geber 2011) and critical for conservation, especially because of the recent threats created by climate change and other anthropogenic changes to the environment (Parmesan et al. 2005).

The Jaguarundi, *Puma (Herpailurus) yagouaroundi* (É. Geoffroy, 1803), is a small, Neotropical felid with flat head, long tail, and rounded ears (de Oliveira 1998, Charre-Medellin et al. 2011) that presents 3 major pelage patterns: a dark phase (apparently the most common), a reddish-yellow phase, and a grey phase (de Oliveira 1998). The Jaguarundi is considered a generalist predator and occupies a broad spectrum of low-altitude habitats (Giordano 2015), such as wet and dry tropical and subtropical forests, semiarid scrublands, scrub savannas, dense chaparrals, and scrub deserts (Hall 1981, de Oliveira 1998).

Classified by the IUCN as Least Concern, this species

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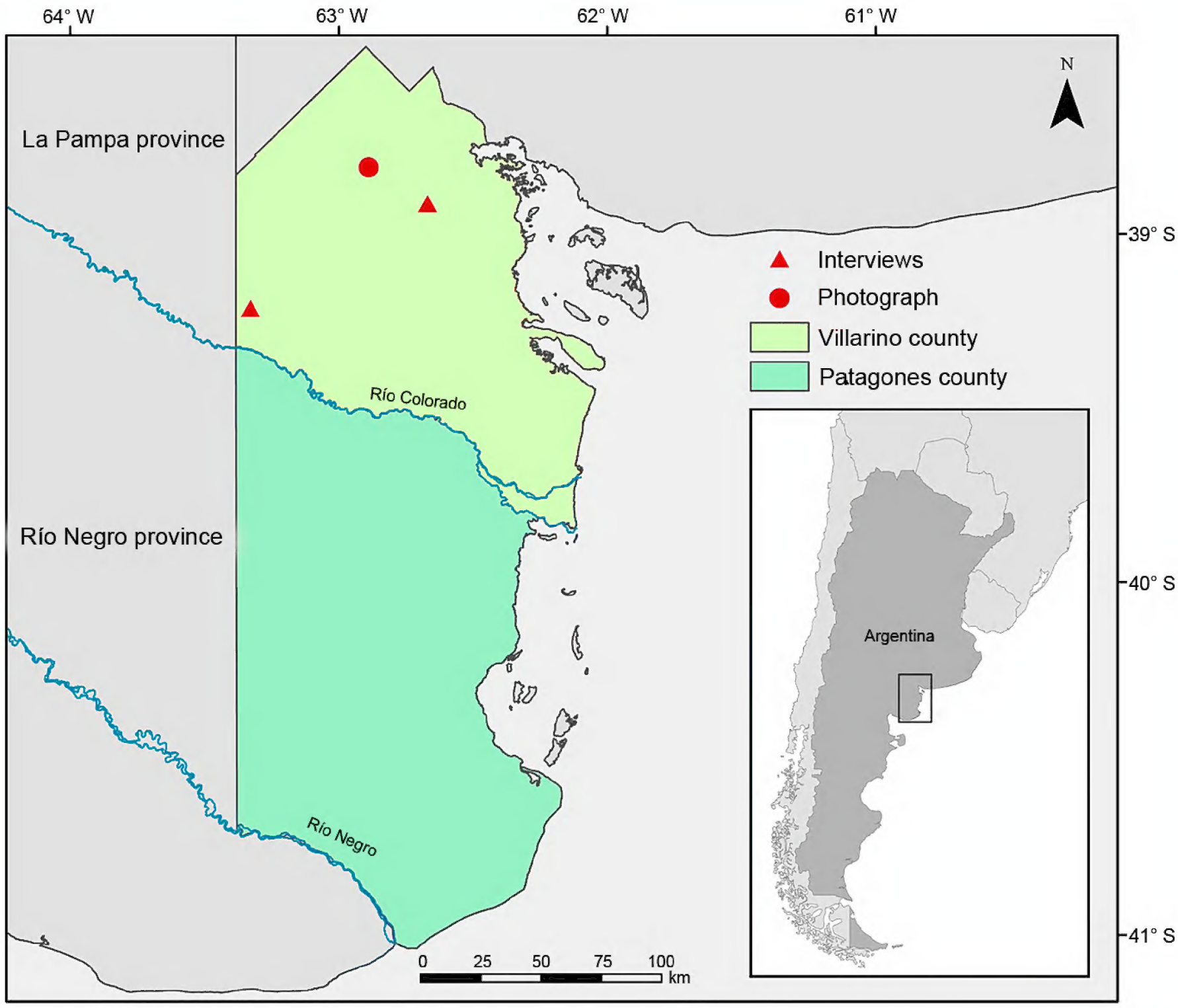

Figure 1. Map showing the area surveyed in this work (Villarino and Patagones counties, Argentina) and the location of the Jaguarundi records obtained. The Rio Negro is historically considered the southern limit of the distribution range of this felid.

is currently affected by anthropogenic threats (Giordano 2015). Although Jaguarundis have never suffered from the hunting for fur trade that reduced the populations of many spotted cat species (Broad 1987), illegal hunting occurs and is mainly in retaliation for poultry predation and related to medical and ornamental purposes (Bianchi et al. 2011, Amador-Alcalá et al. 2013, Giordano 2015). Although the available information suggests that this cat can adapt to relatively fragmented and altered landscapes (Thornton et al. 2011, Giordano 2015), it is unclear how habitat loss and fragmentation affect Jaguarundis.

The paucity of information on Jaguarundis is a reason for concern (Giordano 2015). The number of studies on Jaguarundi ecology is limited and even some basic biology, including distribution, are still little known (Tófoli et al. 2009, Giordano 2015). Its distribution range is wide, extending from southern Texas (USA) to central Argentina (de Oliveira 1998). Most distribution maps of this species historically include the southern part of the Argentine province of Buenos Aires and a small portion of Rio Negro province, immediately south of the Rio Negro at the southern tip of its distribution (e.g. Sunquist and Sunquist 2002, Caso et al. 2015; Fig. 1). However, the most recent reports are over 25 years old (Ximenez 1972, Redford and Eisenberg 1992 for northern Rio Negro province, Zapata 1982 for Buenos Aires) and the distribution map in a recent review on the Jaguarundi distribution (Giordano 2015) did not include the southern part of the Buenos Aires province. Additionally, the most recent confirmed record for central Argentina was from Lihuel Calel National Park (Pereira et al. 2011), La Pampa province (ca 38°00′ S, 065°35′ W), more than 400 km northwest of its alleged southernmost limit.

In the last decades, the region historically considered the southernmost limit of the Jaguarundi's geographic range has been strongly affected by the advance of agriculture, which has resulted in extensive habitat destruction and modification (Pezzola et al. 2004, Brown et al. 2006). Whereas populations at the edges of their ranges are generally more threatened than near the core (Hampe and Petit 2005, Waite and Strickland 2006), the probability of local extinction of the Jaguarundi in its southern limit may be further increased by the accelerating anthropogenic alterations of its natural habitat. After more than 10 years of work by our team with carnivores and people in this area, without any reliable evidence of the species in the region (e.g. photographs, dead animals,

Figure 2. The only photographic record of Jaguarundi obtained in our landscape-scale remote camera trap survey that lasted from 2011 to 2016.

and captures), the occurrence of this species here was doubtful.

Here, we report new presence records of the Jaguarondi from the southernmost part of its known distribution range and estimate the relative abundance of Jaguarundis in this region.

Methods

From 2007 to 2013, we carried out 195 interviews to local ranchers in the southern part of the Espinal region. This ecoregion is characterized by a mixture of xerophytic deciduous woodlands, grassland prairies, and prairies combined with scrublands. The interview sites were distributed across an area of 27,300 km^2 belonging to the counties of Villarino and Patagones (Fig. 1) and were stratified by habitat. To assess the reliability of respondents in their identification of sympatric small cat species, we engaged in a two-step process. First, we solicited an unaided description of each potential candidate species for the region. Second, we asked each respondent to identify candidate species correctly from among a collection of photos that included both native and non-native felid species.

From 2011 to 2016, we completed a habitat-stratified, landscape-scale survey of the mammalian carnivore guild. We deployed 369 camera trap stations across the same area included in our interview-based survey. In May 2016, as part of a new phase of the project, we placed 15 camera traps (Bushnell®) near Levalle, Villarino county.

Results

During the interviews to local ranchers, when we asked about carnivores occurring in the region, the Geoffroy's Cat, *Leopardus geoffroyi* (d'Orbigny and Gervais, 1844), was mentioned by 39.5% of respondents, whereas the Pampas Cat, *Leopardus colocolo pajeros* (Desmarest, 1810), was confirmed by 10.8% of the respondents; in contrast, the presence of Jaguarundis was reliably reported by approximately 1% of the ranchers. Both ranches where these reports originated were in Villarino county, Buenos Aires province, central Argentina (39°12′53″ S, 063°19′45.0″ W and 38°54′44″ S, 062°40′10″ W; Fig. 1).

With camera traps in the landscape-scale survey we recorded Geoffroy's Cats at 38.8% of the stations and Pampas Cats at 1.9%. Jaguarundis were not recorded in this phase but during the new phase of the project on 1 May 2016 at 11:01 a.m. local time, a dark-phase, adult Jaguarundi was photographed (Fig. 2) at a station (38°47′28″ S, 062°53′18″ W; Fig. 1) located along a wide trail that separated a natural patch of open shrubland with sparse natural grasses from a patch of uncultivated cropland. The cat in the photo showed a dark short hair very different from that of a Pampas Cat and its small and elongate head with short ears, elongated body, and short legs differ unmistakably from those of a Geoffroy's Cat or a Domestic Cat. The same 15 camera stations also recorded the presence of Puma [*Puma concolor* (Linnaeus, 1771)] (n = 8 events, defined as all those photos with a temporal separation of at least 30 min from each other), Geoffroy's Cat (n = 81), Pampas Fox [*Lycalopex*

gymnocercus (Fischer, 1814)] (n = 48), Lesser Grison [*Galictis cuja* (Molina, 1782)] (n = 8), and Molina's Hog-nosed Skunk [*Conepatus chinga* (Molina, 1782)] (n = 8).

Discussion

Given the scarcity of scientific information on the Jaguarundi, the data reported here are important for 2 main reasons. First, they confirm that Jaguarundis still occur near the southernmost limit of their original geographic range, and do so in spite of the extensive anthropogenic modifications of natural habitats in of Buenos Aires province. Second, our results strongly suggest that this cat is very rare in the region. Although our naïve occurrence data do not account for possible interspecific differences in detection probabilities, which could strongly affect density estimates of small cats (Reppucci et al. 2011), it is unlikely that more precise estimates of abundance would contrast with our conclusions for this general region. Our conclusion is also supported by the results of our interviews with local inhabitants and is in line with those from other regions (Maffei and Noss 2007, Di Bitetti et al. 2010). It therefore is consistent with the hypothesis that Jaguarundi densities in the region may be lower than previously assumed (Giordano 2015). Interestingly, Jaguarundis also appear to be rare in the only published work with the same felid community (in the nearby Argentine Monte ecoregion; Pereira et al. 2011). Although in general species are rarer close to their distributional limits (Waite and Strickland 2006), it is also possible that Jaguarundi abundance might be strongly affected by intraguild competition with the comparatively abundant and ubiquitous Geoffroy's Cat in our study area (de Oliveira et al. 2010). In addition (or alternatively), the influence of climate change cannot be ruled out, especially because the region was impacted by a serious drought from 2005 to 2009.

Regardless of the reason, the extreme rarity of Jaguarundis suggests that this cat may be in immediate danger of extinction in the southernmost part of its distribution and that further studies are essential to clarify its conservation status globally and particularly in its southern range.

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Authors' Contributions

All authors contributed equally with fieldwork and in writing the manuscript.

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